TCF4 gene

transcription factor 4

Normal Function

The *TCF4* gene provides instructions for making a gene that attaches (binds) to specific regions of DNA and helps control the activity of many other genes. On the basis of this action, the TCF4 protein is known as a transcription factor. The TCF4 protein is part of a group of proteins known as E-proteins. E-proteins each bind with another identical or similar protein and then bind to a specific sequence of DNA known as an E-box. E-proteins are involved in many aspects of development.

The TCF4 protein is found in the brain, muscles, lungs, and heart. This protein also appears to be active (expressed) in various tissues before birth. The TCF4 protein plays a role in the maturation of cells to carry out specific functions (cell differentiation) and the self-destruction of cells (apoptosis).

Health Conditions Related to Genetic Changes

distal 18q deletion syndrome

Fuchs endothelial dystrophy

Pitt-Hopkins syndrome

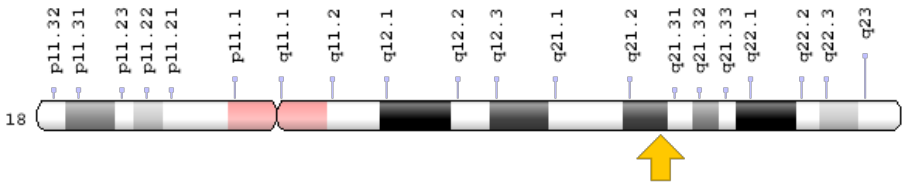
At least 50 mutations in the *TCF4* gene have been found to cause Pitt-Hopkins syndrome, a condition characterized by severe intellectual disability and breathing problems. Some mutations delete a few building blocks of DNA (nucleotides) within the *TCF4* gene, while other mutations delete the *TCF4* gene as well as a number of genes that surround it. Still other *TCF4* gene mutations replace single nucleotides. The size of the mutation does not appear to affect the severity of the condition; people with large deletions and those with single nucleotide changes seem to have similar signs and symptoms.

TCF4 gene mutations disrupt the protein's ability to bind to DNA and control the activity of certain genes. These gene mutations typically do not affect the TCF4 protein's ability to bind to other proteins. The TCF4 protein's inability to bind to DNA and control the activity of certain genes, particularly those genes involved in nervous system development and function, contributes to the signs and symptoms of Pitt-Hopkins syndrome. It is also likely that the loss of the normal proteins that are attached to the nonfunctional TCF4 proteins contribute to the features of this condition.

Chromosomal Location

Cytogenetic Location: 18q21.2, which is the long (q) arm of chromosome 18 at position 21.2

Molecular Location: base pairs 55,222,331 to 55,635,993 on chromosome 18 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- bHLHb19
- class B basic helix-loop-helix protein 19
- E2-2
- immunoglobulin transcription factor 2
- ITF-2
- ITF2
- ITF2_HUMAN
- SEF-2
- SEF2
- TCF-4

Additional Information & Resources

Educational Resources

- Developmental Biology (sixth edition, 2000): Transcription Factors https://www.ncbi.nlm.nih.gov/books/NBK10023/#A763

GeneReviews

- Pitt-Hopkins Syndrome https://www.ncbi.nlm.nih.gov/books/NBK100240

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28TCF4%5BTI%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1440+days%22%5Bdp%5D

OMIM

- TRANSCRIPTION FACTOR 4
  http://omim.org/entry/602272

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_TCF4.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=TCF4%5Bgene%5D
- HGNC Gene Family: Basic helix-loop-helix proteins
  http://www.genenames.org/cgi-bin/genefamilies/set/420
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=11634
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/6925
- UniProt
  http://www.uniprot.org/uniprot/P15884

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